

# SCIENCE AND TECHNOLOGY OF FERROELECTRIC MATERIALS

Rosario, Argentina  
23 SEPTEMBER TO 2 OCTOBER 2002



Argonne National Laboratory  
USA

Organizing  
Institutions

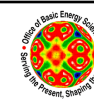


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Department of Energy  
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## PAN-AMERICAN ADVANCED STUDY INSTITUTE

### SCIENCE AND TECHNOLOGY OF FERROELECTRIC MATERIALS

pasi@anl.gov  
www.msd.anl.gov/pasi

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## OBJECTIVE

To provide an overview of the "Science and Technology of Ferroelectric Materials" with special emphasis on the current fundamental knowledge on ferroelectricity and state of the art technology related to ferroelectric thin film-based devices (e.g., non-volatile ferroelectric random access memories (FeRAMs), piezoelectric actuators and sensors, high-dielectric constant film-based devices). While this Institute is primarily intended for graduate students and post docs, other applicants will be given full consideration.

## INSTITUTE OVERVIEW

- Lectures (2 hrs each) and invited talks (1 hr each) on focused topics, presented by experts in the field
- Oral presentations by participants (selected from abstracts submitted by participants)
- Poster sessions with papers presented by participants
- Discussion sessions will be organized, and informal discussions between lecturers and students will be actively promoted

## GENERAL INFORMATION

- Attendance will be limited to approximately 40 students from the USA and Latin America
- The working language of the PASI will be English
- All participants will receive a copy of the published proceedings.
- Travel and living expenses will be paid by the PASI through an NSF-DOE grant
- Participants will be responsible for arranging their own documentation to enter Argentina (e.g., obtain visa if necessary)
- It will be springtime in Rosario and Buenos Aires at the time of the PASI. The temperature is about 20 °C and the climate is pleasant
- The PASI web site is [www.msd.anl.gov/pasi](http://www.msd.anl.gov/pasi). Our e-mail is [pasi@anl.gov](mailto:pasi@anl.gov)

## SCIENTIFIC PROGRAM

(All speakers have confirmed their participation)

### Fundamentals of Ferroelectricity, Piezoelectricity, and Pyroelectricity (11 hours)

- Fundamentals of Ferroelectricity Experiment - S. K. Streiffer, USA (Lecture, 2 hrs)
- Brief History of Ferroelectricity - L. E. Cross, USA (Invited Talk, 1 hr)
- Fundamentals of Ferroelectric Theory - R. L. Migoni, Argentina (Lecture, 2 hrs)
- Introduction to Applications of Ferroelectricity - R. Ramesh, USA (Invited Talk, 1 hr)
- Fundamentals of Ferroelectricity - Round Table (1hr)

- Fundamentals of Crystallography and Mechanical Properties of Piezoelectric Materials - S. Trolier-McKinstry, USA (Lecture, 2 hrs)
- Fundamentals of Piezoelectricity, Relaxor Ferroelectric and Phase Switching Materials - L. E. Cross, USA (Lecture, 2 hrs)

### Synthesis, Characterization and Properties of Ferroelectric Thin Films (19 hours)

- PVD and MOCVD of Ferroelectric Thin Films - O. Auciello, USA (Lecture, 2 hrs)
- Fundamentals and Application of Chemical Solution Techniques for the Synthesis of Ferroelectric Thin Films - O. de Sanctis, Argentina (Invited Talk, 1 hr)
- Magnetron Sputter Deposition of Ferroelectric Thin Films - P. Prieto, Colombia (Invited Talk, 1 hr)
- Microstructure and Dielectric Properties of Ba<sub>0.8</sub>Sr<sub>0.2</sub>TiO<sub>3</sub> Thin Film Prepared by Sol-Gel Process - E. Leite, Brasil (Invited Talk, 1hr)
- Studies of Ferroelectric Film Growth and Interface Processes via Complementary *In Situ* and *Ex Situ* Characterization Techniques - O. Auciello, USA (Invited Talk, 1 hr)
- Analysis of Perovskites by Raman and Infrared Spectroscopies - R. Katiyar, Puerto Rico (Invited Talk, 1 hr)
- Ferroelectric Thin Films Prepared from Polymeric Precursors - J. Varela, Brasil (Invited Talk, 1 hr)
- Electrical Properties of Ferroelectric Thin Films - J. F. Scott, UK (Lecture, 2 hrs)
- Studies of Local Structure in Perovskites Using Perturbative Angular Correlation Spectroscopy - A. López-García, Argentina (Invited Talk, 1 hr)
- TEM Studies of Ferroelectric Thin Films - S. Stemmer, USA (Lecture, 2 hrs)
- Characterization of Electrical Properties of High Dielectric Constant (K) Thin Films - S. K. Streiffer, USA (Invited Talk, 1 hr)
- Ferroelectric Phenomena at the Nanoscale - R. Ramesh, USA (Lecture, 2 hrs)
- Synthesis and Characterization of Ferroelectric Superlattices - D. Schlom, USA (Lecture, 2hrs)
- A Bottom-Up Approach for Functional Oxide Nanostructures via Site-and Shape-Specific Nanopatterning - V. Dravid, US (Invited Talk, 1hr)

### Simulation of Ferroelectrics (5 hours)

- First Principle Calculations of Ferroelectric Perovskites - O. Rodriguez, Argentina (Invited Talk, 1 hr)
- Introduction to Atomic-Level Simulation of Ferroelectrics - M. Stachiotti, Argentina (Lecture, 2 hrs)
- Simulation of Ferroelectric/Paraelectric Solid Solutions and Heterostructures - S. R. Phillpot, USA (Lecture, 2 hrs)

### Technology of Ferroelectric Devices (4 hrs)

- Critical Analysis of PZT vs SBT-based FeRAMS - J. T. Evans, USA (Lecture, 2 hrs)
- Piezoelectric MEMS and Pyroelectric Devices - S. Trolier-McKinstry, USA (Invited Talk, 1 hr)
- Bringing a FeRAM Device to Market (e.g., Smart Cards) - C. Paz de Araujo and O. Auciello, USA (Invited Talk, 1 hr)

### Future of Ferroelectricity (3 hrs)

- Challenges for Experiments - S. K. Streiffer and S. Trolier-McKinstry, USA (Invited Talk, 1 hr)
- Challenges for Theory and Simulation - R. Migoni and M. Stachiotti, Argentina, S. R. Phillpot, USA (Invited Talk, 1 hr)
- Challenges for Technology of FeRAMs - J. T. Evans, USA (Invited Talk, 1 hr)

### Participant Contributions (8 hrs)

- Oral Presentations by Students, selected from Submitted Abstracts (4 hrs)
- Posters by Students (4 hrs)

## SOCIAL PROGRAM

- Wednesday September 25**
- Friday September 27**
- Saturday and Sunday (September 28 & 29)**
  - Argentinean barbecue and visit to "Estancia"
  - Boat Ride on the River Parana
  - Free time (tours through Rosario) or weekend visit to Buenos Aires (tour packages or hotel for individual trip will be arranged at reasonable prices)
  - Banquet in Argentinean restaurant with "Tango Music and Dance"
- Tuesday October 1**

## How to Apply (Deadline 1 July 2002)

Send e-mail to [pasi@anl.gov](mailto:pasi@anl.gov) or apply online at [www.msd.anl.gov/pasi](http://www.msd.anl.gov/pasi)

### Include the following contact information

Full Name  
Title (e.g., grad student, postdoc)  
Sex (used only to determine room-sharing arrangements)  
Institution  
Address (Street Address, City, Post Code, Country) :  
E-mail and web address  
Phone Number  
Fax Number

Please explain why you wish to participate

Provide a title if you would like to present a paper or poster - please include an abstract of 300 words or less

Graduate students should arrange for an e-mail of recommendation to be send from their thesis advisor to [pasi@anl.gov](mailto:pasi@anl.gov)

Visit the PASI web site at: [www.msd.anl.gov/pasi](http://www.msd.anl.gov/pasi)

## FINANCIAL SUPPORT

**SPONSORS**  
National Science Foundation  
Department of Energy - Basic Energy Sciences

**Other Financial Support**  
CLAF (Latin American Center of Physics)  
Materials Science Division, Argonne National Laboratory

**Endorsement**  
This PASI is endorsed by the Materials Research Society

## VENUE

### ROSARIO, ARGENTINA



Plaza Real Hotel  
<http://www.plazarealhotel.com>